

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) EP 1 016 894 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
28.03.2001 Bulletin 2001/13

(51) Int. Cl.⁷: G02F 1/1333, G02F 1/1335,
G02F 1/133, H04N 9/31

(43) Date of publication A2:
05.07.2000 Bulletin 2000/27

(21) Application number: 99125972.2

(22) Date of filing: 28.12.1999

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 28.12.1998 JP 37172098
01.03.1999 JP 5206199

(71) Applicant: Kyocera Corporation
Kyoto 612-8501 (JP)

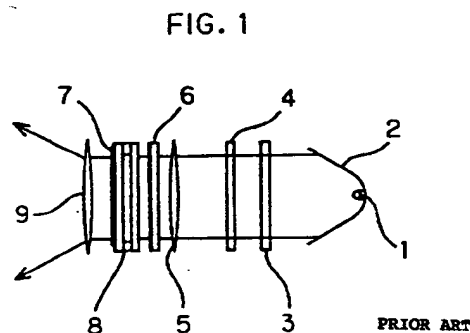
(72) Inventors:
• Umehara, Motohiro,
Kyocera Corp., Shiga Factory
Yokaichi-shi, Shiga 527-0073 (JP)

• Banjo, Hideki,
Kyocera Corp., Omiya Office
Omiya-shi, Saitama 331-0852 (JP)
• Watanabe, Kenichi,
Kyocera Corp., Shiga Factory
Gamo-gun, Shiga 529,1595 (JP)
• Ueda, Yoshio,
Kyocera Corporation
Kyoto 612-8501 (JP)

(74) Representative:
Steil, Christian, Dipl.-Ing. et al
Witte, Weller & Partner,
Rotebühlstrasse 121
70178 Stuttgart (DE)

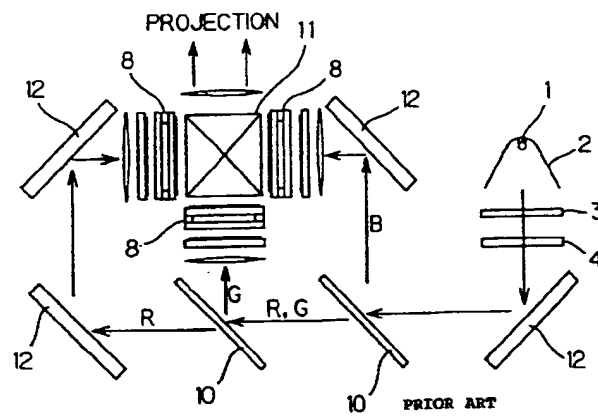
(54) Liquid crystal display device

(57) The present invention provides a liquid crystal display device, which includes a liquid crystal panel (8) as one of optical components for transmitting, absorbing or reflecting light. At least any one of the optical components is comprised of a sapphire substrate. The optical components further include a lens (4), and a polarizer (6, 7) having a polarizer film (13) and a retaining plate (15) for retaining the polarizer film, and the liquid crystal panel (8) may include a transparent substrate (19, 20). In this case, any one of the lens, the retaining plate and transparent substrates is comprised of a sapphire substrate, and thus, it is possible to provide a transmission type liquid crystal display device which transmits light from the light source (1) through the lens (4), the polarizer (6, 7) and the liquid crystal panel (8) so that light is projected.



EP 1 016 894 A3

FIG. 2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 12 5972

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 509 630 A (DOLGOFF EUGENE) 21 October 1992 (1992-10-21) - * column 12, line 30 - column 13, line 1; figures 1,2 * * column 17, line 14 - column 17, line 46 *	1,2	G02F1/1333 G02F1/1335 G02F1/133 H04N9/31
Y		3-6, 10-14,19 7,15-18	
A			
Y	US 5 835 179 A (YAMANAKA HIDEO) 10 November 1998 (1998-11-10) * the whole document *	3-6, 10-14,19	
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 286 (P-1376), 25 June 1992 (1992-06-25) & JP 04 076523 A (FUJITSU LTD), 11 March 1992 (1992-03-11) * abstract *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			G02F H04N
-The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 21 November 2000	Examiner Lerbinger, K
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			

EPO FORM 1503 (3.8.92) (P4/C01)



European Patent
Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number

EP 99 12 5972

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-4,7,10-19

A projector comprising a liquid crystal display panel, a lens, and a polarizer. The material of the transparent substrates of the liquid crystal panel is sapphire.

2. Claims: 3,4,7,9

A projector comprising a liquid crystal panel, a lens and a polarizer. The polarizer comprises polarizer film and a retaining plate which is made of sapphire.

3. Claims: 3,4,8

A projector comprising a liquid crystal panel, a lens and a polarizer. The lens is made of sapphire.

4. Claims: 4-7

A projector comprising a liquid crystal panel, a lens, a polarizer, and a wavelength selective optical component for transmitting or reflecting light having a specific wavelength band. The wavelength selective optical component is made of sapphire.

Consequently, there are four different concepts involved in the set of claims. The common concept, using sapphire as material for an optical component, is known from EP 509 630 A2 (see column 17, lines 18 to 23). The solutions proposed in the various dependent claims solve different technical problems which are not linked by a common inventive concept.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 12 5972

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-11-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0509630 A	21-10-1992	US 5300942 A	05-04-1994
		AU 663080 B	28-09-1995
		AU 1428592 A	15-09-1992
		BR 9205678 A	07-06-1994
		JP 7072443 A	17-03-1995
		WO 9215082 A	03-09-1992
		US 5602679 A	11-02-1997
		US 5900982 A	04-05-1999
US 5835179 A	10-11-1998	JP 10123964 A	15-05-1998
JP 04076523 A	11-03-1992	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82